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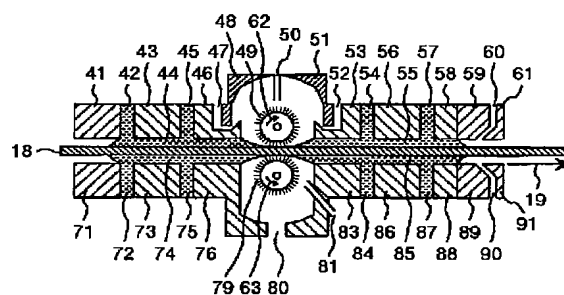
(54) 【発明の名称】 板状基板の処理装置及び処理方法

(57) 【要約】

【課題】板状基板の処理において、装置構成の簡易・小形化、使用処理液量の縮減化、異物再付着の大幅軽減化を図る。

【解決手段】対向する親水性表面間の隙間部に処理液が充填された第1、第2の処理部と、該第1、第2の処理部間にあって処理液または被処理基板に対し外力を与える第3の処理部とを備え、該第1、第2の処理部がそれぞれ、上記親水性表面を有した第1の部材と、該第1の部材の端部側にあって対向する撥水性表面が該第1の部材の隙間部に略連続する隙間部を形成し処理液を該端部近傍において該第1の部材側にはじく第2の部材とを有した構成とする。

図 3



【特許請求の範囲】

【請求項 1】板状基板を流体で処理する板状基板の処理装置において、

対向する親水性表面間の隙間部に処理液が充填された第 1 の処理部と、該第 1 の処理部の後に配され処理液または上記板状基板に対して外力を与える第 2 の処理部と、該第 2 の処理部の後に配され対向する親水性表面間の隙間部に処理液が充填された第 3 の処理部とを備え、該第 1、第 3 の処理部はそれぞれ、上記親水性表面を有する第 1 の部材と、該第 1 の部材の端部側において対向する撥水性表面が該第 1 の部材の隙間部に略連続する隙間部を形成し処理液を該端部近傍において該第 1 の部材側にはじくようにした第 2 の部材とを有して構成され、上記板状基板を、上記第 1 の処理部の上記各隙間部、上記第 2 の処理部、及び上記第 3 の処理部の上記各隙間部を通すことにより、上記処理液で流体処理するようにした構成を特徴とする板状基板の処理装置。

【請求項 2】板状基板を流体で処理する板状基板の処理装置において、

対向する親水性表面間の隙間部に処理液が充填された第 1 の処理部と、該第 1 の処理部の後に配され処理液または上記板状基板に対して外力を与え該基板の表面から少なくとも異物を強制除去する第 2 の処理部と、該第 2 の処理部の処理動作によって飛散した処理液を吸い込む飛散液吸込部と、上記第 2 の処理部の後に配され対向する親水性表面間の隙間部に処理液が充填された第 3 の処理部とを備え、かつ、該第 1、第 3 の処理部はそれぞれ、上記親水性表面を有する第 1 の部材と、該第 1 の部材の端部側において対向する撥水性表面が該第 1 の部材の上記親水性表面間の隙間部に略連続する隙間部を形成し処理液を該端部近傍において該第 1 の部材側にはじく第 2 の部材とを有して構成され、

上記板状基板を、上記第 1 の処理部の上記隙間部、上記第 2 の処理部、及び上記第 3 の処理部の上記隙間部を通すことにより、少なくとも異物を除去するとともに、該除去したものの該基板への再付着を減らすようにしたことを特徴とする板状基板の処理装置。

【請求項 3】板状基板を流体で処理する板状基板の処理装置において、

対向する親水性表面間の隙間部に処理液が充填された第 1 の処理部と、処理液または上記板状基板に対して外力を与えるようブラシが回転する回転ブラシを備えた第 2 の処理部と、該回転ブラシの回転で飛散した処理液を吸い込む飛散液吸込手段と、上記第 2 の処理部の後に配され対向する親水性表面間の隙間部に処理液が充填された第 3 の処理部と、上記処理液を少なくとも上記第 1、第 2、第 3 の処理部のいずれかに供給する処理液供給手段と、該供給した処理液を吸い込む処理液吸込手段と、上記基板の表面に不活性ガスを噴射する第 4 の処理部とを備え、かつ、該第 1、第 3 の処理部はそれぞれ、上記親

水性表面を有する第 1 の部材と、該第 1 の部材の端部側において対向する撥水性表面が該第 1 の部材の上記親水性表面間の隙間部に略連続する隙間部を形成し処理液を該端部近傍において該第 1 の部材側にはじく第 2 の部材とを有して構成され、

上記板状基板を、上記第 1 の処理部の上記隙間部、上記第 2 の処理部、上記第 3 の処理部の上記隙間部及び上記第 4 の処理部を通すことにより、少なくとも異物を除去するとともに、該除去したものの該基板への再付着を減らすようにしたことを特徴とする板状基板の処理装置。

【請求項 4】板状基板を流体で処理する板状基板の処理装置において、

対向する親水性表面間の隙間部に処理液が充填された第 1 の処理部と、上記処理液または上記板状基板に対し超音波スプレーから処理液が噴射される第 2 の処理部と、該噴射で飛散した処理液を吸い込む飛散液吸込手段と、上記第 2 の処理部の後に配され対向する親水性表面間の隙間部に処理液が充填された第 3 の処理部と、上記処理液を少なくとも上記第 1、第 2、第 3 の処理部のいずれかに供給する処理液供給手段と、該供給した処理液を吸い込む処理液吸込手段と、上記基板の表面に不活性ガスを噴射する第 4 の処理部とを備え、かつ、該第 1、第 3 の処理部はそれぞれ、上記親水性表面を有する第 1 の部材と、該第 1 の部材の端部側において対向する撥水性表面が該第 1 の部材の上記親水性表面間の隙間部に略連続する隙間部を形成し処理液を該端部近傍において該第 1 の部材側にはじく第 2 の部材とを有して構成され、

上記板状基板を、上記第 1 の処理部の上記隙間部、上記第 2 の処理部、上記第 3 の処理部の上記隙間部及び上記第 4 の処理部を通すことにより、少なくとも異物を除去するとともに、該除去したものの該基板への再付着を減らすようにしたことを特徴とする板状基板の処理装置。

【請求項 5】板状基板を流体で処理する板状基板の処理装置において、

親水性表面が第 1 の隙間を隔て互いに対向して配され該第 1 の隙間部に処理液が充填された第 1 の処理部と、該第 1 の処理部の後に配され撥水性表面が隙間を隔てて互いに対向して配され該隙間部に不活性ガスが充填されるガス充填部と、親水性表面が第 2 の隙間を隔てて互いに対向して配され該第 2 の隙間部に処理液が充填された第 2 の処理部と、上記板状基板の表面に不活性ガスを噴射する第 3 の処理部と、を備え、上記ガス充填部によって上記第 1 の処理部の処理液と上記第 2 の処理部の処理液とが混合しないようにした状態で、上記板状基板を、上記第 1 の処理部、上記ガス充填部、上記第 2 の処理部、及び第 3 の処理部を通すことにより、流体処理するようにした構成を特徴とする板状基板の処理装置。

【請求項 6】上記親水性表面間の距離が略 6 mm 以下とされる請求項 1 から 5 のいずれかに記載の板状基板の処理装置。

【請求項 7】上記処理液供給手段と上記処理液吸込手段はそれぞれ、上記第 1 の処理部及び上記第 3 の処理部に設けられる請求項 3 または請求項 4 に記載の板状基板の処理装置。

【請求項 8】上記処理液供給手段と上記処理液吸込手段は、上記板状基板の移動方向に対し、該処理液供給手段が後側に、該処理液吸込手段が前側になるように配される請求項 7 に記載の板状基板の処理装置。

【請求項 9】上記第 1 の処理部に充填される処理液と、上記第 2 の処理部に充填される処理液とが異なっている請求項 1 から 5 のいずれかに記載の板状基板の処理装置。

【請求項 10】板状基板を流体で処理する板状基板の処理方法において、親水性表面が隙間を隔て互いに対向状態で配され該隙間部に処理液が充填された部分で板状基板に対し第 1 の処理を行うステップと、該第 1 の処理後に該充填された処理液または板状基板に対して外力を与え該被処理基板の表面から少なくとも異物を除去するステップと、該除去動作で飛散した処理液を吸い込むステップと、該除去動作後に親水性表面が隙間を隔て互いに対向して配され該隙間部に処理液が充填された部分で第 2 の処理を行うステップと、上記板状基板の表面に不活性ガスを噴射するステップと、を経て、該板状基板から少なくとも異物を除去するとともに、該除去したものの該基板への再付着を減らすようにすることを特徴とする板状基板の処理方法。

【請求項 11】板状基板を流体で処理する板状基板の処理装置において、対向する部材表面間の隙間部に処理液が充填された第 1 の処理部と、該第 1 の処理部の後に配され処理液または上記板状基板に対して外力を与える第 2 の処理部と、上記第 2 の処理部の後に配され対向する部材表面間の隙間部に処理液が充填された第 3 の処理部とを備え、該第 1、第 3 の処理部はそれぞれ、上記処理液が表面間の隙間部に充填される第 1 の部材と、該第 1 の部材の端部側にあって該処理液の表面張力を該第 1 の部材表面による場合よりも大きくする表面を有し該第 1 の部材の表面間の上記隙間部に略連続する第 2 の隙間部を形成する第 2 の部材とを有して構成され、上記板状基板を、上記第 1 の処理部の上記各隙間部、上記第 2 の処理部、及び上記第 3 の処理部の上記各隙間部を通すことにより、流体処理するようにした構成を特徴とする板状基板の処理装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本願発明は、液晶基板や半導体基板等の板状基板の流体処理技術に係り、特に、基板を流体により外部雰囲気から遮断して処理する技術に関する。

【0002】

【従来の技術】一般に、従来の液晶基板等の製作時の流体処理工程としては、パターンを形成するためにレジストや窒化膜等をマスクとし薄膜を薬液でエッチング除去するウェットエッチング工程、レジストをアッシングした後のレジスト残渣を除去する残渣処理工程、異物を酸化とエッチングにより除去するためのアルカリ性酸化剤添加水溶液による処理工程、異物を除去するために純水や弱アルカリ性水溶液等の流体やブラシ等で洗浄する洗浄工程等が代表的なものとしてある。上記流体処理工程では、被処理基板を大気中で回転させながら、薬液や純水をスプレーしながら超音波またはブラシ等で処理した後、不活性ガスをスプレーし高速で回転させながら乾燥する方法や、また、被処理基板の薄膜化や大型化等に伴い、被処理基板を搬送しながら大気中で洗浄や乾燥の処理を行う、いわゆる平流方式の方法が用いられている。

【0003】

【発明が解決しようとする課題】しかしながら、上記従来技術においてはいずれも、基板処理が大気中で行われるため、これに起因した欠点がある。例えば、上記回転方式の場合は、乾燥処理時に発生した気流の乱れによって、処理チャンバ内に付着した汚染物が巻き上げられて基板面に再付着するという問題があるし、また、上記平流方式の場合も、ブラシや超音波スプレーによって飛散した汚染物が、いったん洗浄された基板の表面に再び付着するという問題がある。また、基板の大型化に伴い、処理チャンバの大型化や、装置の設置面積の増大や、処理用薬液の使用量増大等の問題も生じている。本発明の課題点は、(1) 装置構成が簡単で小形化できること、(2) 処理液の使用量も少なくできること、(3) 処理むらのない高精度処理が可能なこと、(4) 飛散した異物等の基板への再付着を防止または大幅軽減できること、等である。本発明の目的は、かかる課題点を解決した板状基板の処理技術を提供することにある。

【0004】

【課題を解決するための手段】上記課題点を解決するために本発明では、

(1) 板状基板を流体で処理する板状基板の処理装置を、対向する親水性表面間の隙間部に処理液が充填された第 1 の処理部と、該第 1 の処理部の後に配され処理液または上記板状基板に対して外力を与える第 2 の処理部と、該第 2 の処理部の後に配され対向する親水性表面間の隙間部に処理液が充填された第 3 の処理部とを備え、該第 1、第 3 の処理部はそれぞれ、上記親水性表面を有する第 1 の部材と、該第 1 の部材の端部側にあって対向する撥水性表面が該第 1 の部材の上記親水性表面間の隙間部に略連続する隙間部を形成し処理液を該端部近傍において該第 1 の部材側にはじく第 2 の部材とを有した構成とし、上記板状基板を、上記第 1 の処理部の上記各隙間部、上記第 2 の処理部、及び上記第 3 の処理部の上記

各隙間部を通すことにより、流体処理する構成とする。

(2) 板状基板を流体で処理する板状基板の処理装置を、対向する親水性表面間の隙間部に処理液が充填された第1の処理部と、該第1の処理部の後に配され処理液または上記板状基板に対して外力を与え該基板の表面から少なくとも異物を強制除去する第2の処理部と、該第2の処理部の処理動作によって飛散した処理液を吸い込む飛散液吸込部と、上記第2の処理部の後に配され対向する親水性表面間の隙間部に処理液が充填された第3の処理部とを備え、かつ、該第1、第3の処理部はそれぞれ、上記親水性表面を有する第1の部材と、該第1の部材の端部側において対向する撥水性表面が該第1の部材の上記親水性表面間の隙間部に略連続する隙間部を形成し処理液を該端部近傍において該第1の部材側にはじく第2の部材とを有した構成とし、上記板状基板を、上記第1の処理部の上記隙間部、上記第2の処理部、及び上記第3の処理部の上記隙間部を通すことにより、少なくとも異物を除去するとともに、該除去したものの該基板への再付着を減らすようにする。

【0005】(3) 板状基板を流体で処理する板状基板の処理装置を、対向する親水性表面間の隙間部に処理液が充填された第1の処理部と、処理液または上記板状基板に対して外力を与えるようブラシが回転する回転ブラシを備えた第2の処理部と、該回転ブラシの回転で飛散した処理液を吸い込む飛散液吸込手段と、上記第2の処理部の後に配され対向する親水性表面間の隙間部に処理液が充填された第3の処理部と、上記処理液を少なくとも上記第1、第2、第3の処理部のいずれかに供給する処理液供給手段と、該供給した処理液を吸い込む処理液吸込手段と、上記基板の表面に不活性ガスを噴射する第4の処理部とを備え、かつ、該第1、第3の処理部はそれぞれ、上記親水性表面を有する第1の部材と、該第1の部材の端部側において対向する撥水性表面が該第1の部材の上記親水性表面間の隙間部に略連続する隙間部を形成し処理液を該端部近傍において該第1の部材側にはじく第2の部材とを有した構成とし、上記板状基板を、上記第1の処理部の上記隙間部、上記第2の処理部、上記第3の処理部の上記隙間部及び上記第4の処理部を通すことにより、少なくとも異物を除去するとともに、該除去したものの該基板への再付着を減らすようにする。

(4) 板状基板を流体で処理する板状基板の処理装置を、対向する親水性表面間の隙間部に処理液が充填された第1の処理部と、上記処理液または上記板状基板に対し超音波スプレーから処理液が噴射される第2の処理部と、該噴射で飛散した処理液を吸い込む飛散液吸込手段と、上記第2の処理部の後に配され対向する親水性表面間の隙間部に処理液が充填された第3の処理部と、上記処理液を少なくとも上記第1、第2、第3の処理部のいずれかに供給する処理液供給手段と、該供給した処理液を吸い込む処理液吸込手段と、上記基板の表面に不活性

ガスを噴射する第4の処理部とを備え、かつ、該第1、第3の処理部はそれぞれ、上記親水性表面を有する第1の部材と、該第1の部材の端部側において対向する撥水性表面が該第1の部材の上記親水性表面間の隙間部に略連続する隙間部を形成し処理液を該端部近傍において該第1の部材側にはじく第2の部材とを有した構成とし、上記板状基板を、上記第1の処理部の上記隙間部、上記第2の処理部、上記第3の処理部の上記隙間部及び上記第4の処理部を通すことにより、少なくとも異物を除去するとともに、該除去したものの該基板への再付着を減らすようにする。

【0006】(5) 板状基板を流体で処理する板状基板の処理装置を、親水性表面が第1の隙間を隔て互いに対向して配され該第1の隙間部に処理液が充填された第1の処理部と、該第1の処理部の後に配され撥水性表面が隙間を隔てて互いに対向して配され該隙間部に不活性ガスが充填されるガス充填部と、親水性表面が第2の隙間を隔てて互いに対向して配され該第2の隙間部に処理液が充填された第2の処理部と、上記板状基板の表面に不活性ガスを噴射する第3の処理部と、を備え、上記ガス充填部によって上記第1の処理部の処理液と上記第2の処理部の処理液とが混合しないようにした状態で、上記板状基板を、上記第1の処理部、上記ガス充填部、上記第2の処理部、及び第3の処理部を通すことにより、流体処理するようにした構成とする。

(6) 上記(1)から(5)において、上記親水性表面間の距離を略6mm以下とする。

(7) 上記(3)または(4)において、上記処理液供給手段と上記処理液吸込手段のそれぞれを、上記第1の処理部及び上記第3の処理部に設ける。

(8) 上記(7)において、上記処理液供給手段と上記処理液吸込手段を、上記板状基板の移動方向に対し、該処理液供給手段が後側に、該処理液吸込手段が前側になるように配する。

(9) 上記(1)から(5)において、上記第1の処理部に充填される処理液と、上記第2の処理部に充填される処理液とが異なるようにする。

【0007】(10) 板状基板を流体で処理する板状基板の処理方法として、親水性表面が隙間を隔て互いに対向状態で配され該隙間部に処理液が充填された部分で板状基板に対し第1の処理を行うステップと、該第1の処理後に該充填された処理液または板状基板に対して外力を与え該被処理基板の表面から少なくとも異物を除去するステップと、該異物除去動作で飛散した処理液を吸い込むステップと、該異物除去動作後に親水性表面が隙間を隔て互いに対向して配され該隙間部に処理液が充填された部分で第2の処理を行うステップと、上記板状基板の表面に不活性ガスを噴射するステップと、を経て、該板状基板から少なくとも異物を除去するとともに、該除去したものの該基板への再付着を減らすようにする。

(11) 板状基板を流体で処理する板状基板の処理装置を、対向する部材表面間の隙間部に処理液が充填された第1の処理部と、該第1の処理部の後に配され処理液または上記板状基板に対して外力を与える第2の処理部と、上記第2の処理部の後に配され対向する部材表面間の隙間部に処理液が充填された第3の処理部とを備え、該第1、第3の処理部をそれぞれ、上記処理液が表面間の隙間部に充填される第1の部材と、該第1の部材の端部側にあって該処理液の表面張力を該第1の部材表面による場合よりも大きくする表面を有し該第1の部材の表面間の上記隙間部に略連続する第2の隙間部を形成する第2の部材とを有した構成とし、上記板状基板を、上記第1の処理部の上記各隙間部、上記第2の処理部、及び上記第3の処理部の上記各隙間部を通すことにより、流体処理するようにする。

【0008】

【発明の実施の形態】以下、本発明の実施例を、図面を用いて説明する。図1は、本発明における処理部の基本構成の説明図であって一構成例を示し、(a)は斜視図、(b)はその断面図である。図1において、1は第1の撥水性部材、2は処理液吸引口、3は第1の親水性部材、4は処理液、5は処理液供給口、6は第2の親水性部材、7は第2の撥水性部材、18は処理する板状基板、19は該板状基板18の搬送方向、21は第1の下部撥水性部材、22は第1の下部処理液の吸引口、23は第1の下部親水性部材、24は第1の下部処理液、25は第1の下部処理液の供給口、26は第2の下部親水性部材、27は第2の下部撥水性部材、102は処理液吸引用パイプ、105は処理液供給用パイプである。被処理基板18の搬送方向19に沿って、第1の撥水性部材1と、第1の下部撥水性部材21と、処理液吸引口2と、第1の下部処理液の吸引口22と、第1の親水性部材3と、第1の下部親水性部材23と、処理液供給口5と、第1の下部処理液の供給口25と、第2の親水性部材6と、第2の下部親水性部材26と、第2の撥水性部材7と、第2の下部撥水性部材27とを配し、該第1の撥水性部材1と第1の下部撥水性部材21とを対向させ、第1の親水性部材3と第1の下部親水性部材23とを対向させ、第2の親水性部材6と第2の下部親水性部材26とを対向させ、第2の撥水性部材7と第2の下部撥水性部材27とを対向させてある。該第1の親水性部材3と第1の下部親水性部材23との対向部、及び、第2の親水性部材6と第2の下部親水性部材26との対向部に形成される隙間部には、上記処理液供給口5と第1の下部処理液の供給口25から処理液4、24が隙間部に供給され、過剰の処理液は処理液吸引口2及び第1の下部処理液の吸引口22から外部側に排出される。処理液の外部側への排出にあたっては、処理液吸引口2からの液だけを処理液吸引パイプ102を通してよいし、第1の下部処理液の吸引口22からの処理液もいっしょ

に該処理液吸引パイプ102を通すようにしてもよい。上記処理液供給口5と上記第1の下部処理液の供給口25から供給する処理液についても同様で、処理液供給パイプ105から、該処理液供給口5と該第1の下部処理液の供給口25とに処理液を供給してもよいし、または、各供給口5、25へそれぞれ別個の供給パイプから供給するようにしてもよい。該処理液の供給及び吸引は、板状基板18の幅方向に略平均化されて液の流れが発生するように行われるのが望ましい。第1の撥水性部材1と第1の下部撥水性部材21の対向部、及び第2の撥水性部材7と第2の下部撥水性部材27の対向部では、処理液4、24が、第1の親水性部材3と第1の下部親水性部材23との対向部間隙間部、及び第2の親水性部材6と第2の下部親水性部材26との対向部間隙間部の方向にはじかれ、該処理液の該部における表面張力が高められる。該状態で、基板18を上記処理液中を通し、洗浄等の処理を行う。板状基板18の搬送移動中に、処理液4、24は、処理液供給口5と第1の下部処理液の供給口25とから絶えず供給しかつ処理液吸引口2及び第1の下部処理液の吸引口22から絶えず外部に排出するようにして隙間部において流れを形成するようにしてもよいし、または、処理時に供給も排出もしない状態にしておいてもよい。本実施例の構成では、処理液の流れを形成する場合は、該流れの方向は該基板18の搬送方向とは逆の方向になるようにし、基板18に対する液の流れの相対速度が上がるようにする等して、基板面から異物等が除去され易いようにしてある。また、第1の親水性部材3と第1の下部親水性部材23との対向部、及び、第2の親水性部材6と第2の下部親水性部材26との対向部に形成される隙間部の寸法(対向面間距離)は略6mm以下がよい。基板18は搬送移動中に表裏面が一定の時間処理液と接し、処理液により同時に処理される。被処理基板18が親水性の場合、第2の撥水性部材7に隣接して外側に不活性ガス供給口を配し、そこで基板18に該不活性ガスを噴射することで基板面に付いている処理液や残滓等を除去できる。以下、本発明の実施例として、上記図1のような基本ユニットに不活性ガス供給構成を組合わせた構成例(第1の実施例)、回転ブラシを組合わせた構成例(第2の実施例)、及び超音波スプレーユニットを組合わせた構成例(第3の実施例)を示す。各実施例では、ウェットエッチング処理、残渣処理、薬液洗浄処理、異物除去洗浄処理等が可能である。

【0009】図2は、本発明の第1の実施例を示す。本第1の実施例は、薬液処理用の構成例であって、上記図1に述べたような基本構成のユニットを2基用い、該ユニット相互間に不活性ガス供給部を配した構成である。第1のユニットでは板状基板18に対し薬液処理を行い、不活性ガス領域を経て、第2のユニットでは該基板18に対しリンス処理を行うようになっている。該不活

性ガス領域では、該不活性ガスにより、該第1、第2のユニット内部に充填された処理液（薬液、リンス液）を互いに遮断状態にし、互いに混じり合わないようにするとともに、該第1のユニットから搬送されてくる基板18に付着した処理液（薬液）除去する。図2において、被処理基板としての板状基板18の上部には、第1の上部撥水性部材1、第1の上部処理液の上部吸引口2、第1の上部親水性部材3、第1の上部処理液の供給口5、第2の上部親水性部材6、第2の上部撥水性部材7、第1の上部不活性ガスの供給口8、第3の上部撥水性部材9、第2の上部処理液の上部吸引口10、第3の上部親水性部材11、第2の上部処理液の上部供給口13、第4の上部親水性部材14、第4の上部撥水性部材15、第2の上部不活性ガス供給口16、第5の上部撥水性部材17が配され、同板状基板18の下部には、第1の下部撥水性部材21、第1の下部処理液の下部吸引口22、第1の下部親水性部材23、第1の下部処理液の供給口25、第2の下部親水性部材26、第2の下部撥水性部材27、第1の下部不活性ガスの供給口28、第3の下部撥水性部材29、第2の下部処理液の下部吸引口30、第3の下部親水性部材31、第2の下部処理液の下部供給口33、第4の下部親水性部材34、第4の下部撥水性部材35、第2の下部不活性ガス供給口36、第5の下部撥水性部材37が配されている。第1の上部撥水性部材1、第1の上部処理液の上部吸引口2、第1の上部親水性部材3、第1の上部処理液の供給口5、第2の上部親水性部材6、及び第2の上部撥水性部材7と、それぞれに対向配置された第1の下部撥水性部材21、第1の下部処理液の下部吸引口22、第1の下部親水性部材23、第1の下部処理液の供給口25、第2の下部親水性部材26、及び第2の下部撥水性部材27が上記第1のユニットを構成し、第3の上部撥水性部材9、第2の上部処理液の上部吸引口10、第3の上部親水性部材11、第2の上部処理液の上部供給口13、第4の上部親水性部材14、及び第4の上部撥水性部材15と、それぞれに対向配置された第3の下部撥水性部材29、第2の下部処理液の下部吸引口30、第3の下部親水性部材31、第2の下部処理液の下部供給口33、第4の下部親水性部材34、及び第4の下部撥水性部材35が上記第2のユニットを構成している。本実施例では、第1の上部処理液4及び第1の下部処理液24は、例えばエッチング処理や洗浄処理に用いられる薬液であり、第2の上部処理液12及び第2の下部処理液32は、例えばリンス用に用いられる純水である。第1の下部処理液24や第2の下部処理液32は、基板18の裏面のエッチングや洗浄等、基板の裏面処理に対して有効である。基板18が第1の処理液（薬液）4、24の領域を通過するときはエッチング処理や洗浄処理等が行われ、第2の処理液（純水）12、32の領域を通過するときはリンス処理等が行われる。第1の上部不活性ガス

供給口8及び第1の下部不活性ガス供給口28から供給される不活性ガスは、第1の処理液（薬液）4、24と第2の処理液12、32（純水）との間を遮断して両処理液が互いに混じり合わないようにするとともに、基板18から第1の処理液や処理残滓を除去する。混合しない処理液はそれぞれ容易に再利用が可能であるし、特に、第2の処理液12、32（純水）においては基板18のリンス効率を向上させ得る。また、第2の上部不活性ガス供給口16及び第2の下部不活性ガス供給口36から供給される不活性ガスは、基板18から第2の処理液や処理残滓を除去する。上記のように、板状基板18は、搬送される過程で、上記第1のユニットでは第1の処理液（薬液）による処理、上記最初の不活性ガス領域では該第1の処理液の除去、上記第2のユニットでは第2の処理液（純水）による処理、上記第2の不活性ガス領域では該第2の処理液の除去がそれぞれ行われ、一連の処理を終える。本実施例によれば、構成が簡単で装置の小形化を図り易い。処理液の使用量も少なくできる。さらに、処理液の再利用も可能である。飛散した汚染物の基板への再付着も軽減または防止できるし、処理流体により基板を外部雰囲気から遮断することにより処理むらをなくした高精度処理も可能である。なお、上記実施例では、基本構成のユニットを2基用いる構成としたが、本発明はこれに限定されず、3基以上のユニットを用いて構成するようにしてもよい。該ユニット内の構成も、図1や図2に示した構成には限定されず、例えば、配列する親水性部材の数を増やした構成等であってもよい。

【0010】図3は、本発明の第2の実施例を示す。本第2の実施例は、回転ブラシを用いた場合の構成例であって、上記第1の実施例の場合と同様、図1に述べたような基本構成のユニットを2基用い、該ユニット相互間に回転ブラシ49、79による処理部を配した構成である。本実施例では、第1のユニットで板状基板18に対し純水等により洗浄処理を行い、回転ブラシによる処理を経て、第2のユニットでも該基板18に対し純水等によるリンス処理を行うようになっている。本実施例では回転ブラシとしてロール型のブラシを用いる。該回転ブラシによる処理工程では、ブラシが回転動作により処理液（純水）または上記板状基板に対して外力を与え、強制的に基板18の面から処理液や異物等を除去するとともに、いったん基板面から除去されて処理液中に入った異物等が基板面に再付着しないようにする。該回転ブラシの回転で飛散した処理液を吸い込むようにした構成も設けてあり、該飛散処理液も基板18に再付着しないようにもしてある。図3において、板状基板18の上部には、第1の上部撥水性部材41、第1の上部処理液の上部吸引口42、第1の上部親水性部材43、第1の上部処理液の供給口45、第2の上部親水性部材46、第2の上部処理液吸引口47、第1の上部飛沫飛散防止板48、上部回転ブラシ49、第2の上部処理液供給口5

0、第2の上部飛沫飛散防止板51、第3の上部処理液供給口52、第3の上部親水性部材53、第4の上部処理液吸引口54、第4の上部親水性部材56、第3の上部処理液供給口57、第5の上部親水性部材58、第2の上部撥水性部材59、上部不活性ガス供給口60、第3の上部撥水性部材61が配され、同板状基板18の下部には、第1の下部撥水性部材71、第1の下部処理液の上部吸引口72、第1の下部親水性部材73、第1の下部処理液の供給口75、第2の下部親水性部材76、下部回転ブラシ49、第2の下部処理液吸引口80、第2の下部処理液供給口81、第3の下部親水性部材83、第4の下部処理液吸引口84、第4の下部親水性部材86、第3の下部処理液供給口87、第5の下部親水性部材88、第2の下部撥水性部材89、下部不活性ガス供給口90、第3の下部撥水性部材91が配されている。第1の上部撥水性部材41、第1の上部処理液の上部吸引口42、第1の上部親水性部材43、第1の上部処理液の供給口45、及び第2の上部親水性部材46と、それぞれに対向配置された第1の下部撥水性部材71、第1の下部処理液の上部吸引口72、第1の下部親水性部材73、第1の下部処理液の供給口75、及び第2の下部親水性部材76が上記第1のユニットを構成し、第3の上部親水性部材53、第4の上部処理液吸引口54、第4の上部親水性部材56、第3の上部処理液供給口57、第5の上部親水性部材58、及び第2の上部撥水性部材59と、それぞれに対向配置された第3の下部親水性部材83、第4の下部処理液吸引口84、第4の下部親水性部材86、第3の下部処理液供給口87、第5の下部親水性部材88、及び第2の下部撥水性部材89が上記第2のユニットを構成している。第1のユニットで洗浄した基板18から、回転ブラシ49、79で異物等の除去や処理液の除去を行い、第2のユニットで該基板18をリンスし、さらに、上部不活性ガス供給口60及び下部不活性ガス供給口90から供給される不活性ガスによって、基板18から処理液や異物等の除去を行う。上部回転ブラシ49の回転で発生する処理液の飛沫は、第1の上部飛沫飛散防止板48と第2の上部飛沫飛散防止板51で飛散が遮られ、かつ、第2の上部処理液吸引口47と第3の上部処理液吸引口52に吸い込まれて外部側に排出されるようになっている。これにより、該飛沫が装置周囲に飛散したり、基板18に再付着したりするのが軽減または防止される。

【0011】本第2の実施例においても、装置構成の簡易化と寸法の小形化を図り易い。処理液の使用量も少なくできる。さらに、処理液の再利用も可能である。飛散した処理液や異物等の基板への再付着も防止できるし、処理流体により基板を外部雰囲気から遮断することにより処理むらをなくした高精度処理も可能である。特に本実施例では、処理液や異物等を確実に基板から除去できかつ再付着も大幅軽減または防止できるため、これらの

除去率を大きく改善できる。なお、図3の実施例では、基本構成のユニットを2基用いる構成としたが、本発明はこれには限定されず、3基以上のユニットを用いる構成であってもよい。該ユニット内の構成も、図1や図3に示した構成には限定されず、配列する親水性部材の数を増やした構成等であってもよい。また、回転ブラシも複数箇所に設け、回転ブラシ処理工程を複数備えるようにしてもよい。

【0012】図4は、本発明の第3の実施例を示す。本第3の実施例は、超音波スプレーユニットを用いた場合の構成であって、図1に述べたような基本構成のユニットを2基用い、該ユニット相互間に超音波スプレーユニットを配した構成である。上記第2の実施例に対し、回転ブラシ49、79に替えて超音波スプレー93、95を用いている点異なる。本第3の実施例でも、板状基板18に対し、第1のユニットで純水等による洗浄処理を行い、超音波スプレー93、95での純水等による洗浄処理を経て、第2のユニットで純水等によるリンス処理を行う。超音波スプレー93、95から噴射される純水等の処理液はその噴射力によって、該噴射口の下方にある処理液44、55、74、85または上記板状基板18の表面及び裏面に対して外力を与えるようになっている。該外力によって該部の該処理液44、55、74、85は攪拌状態またはそれに近い状態にされて該基板18の表面を洗浄するし、超音波スプレー93、95からの噴射液が直接に該基板18表面に当たる場合も、該噴射液が該基板面を洗浄する。上部超音波スプレー93からの噴射で発生する処理液の飛沫は、第1の上部飛沫飛散防止板48と第2の上部飛沫飛散防止板51で飛散が遮られ、かつ、第2の上部処理液吸引口47と第3の上部処理液吸引口52に吸い込まれて外部側に排出されるようになっている。これにより、該飛沫が装置周囲に飛散したり、基板18に再付着したりするのを軽減または防止することができる。

【0013】図5は上記超音波スプレー93の具体的構成例であって、(a)はスポット型スプレーの場合、

(b)はライン型スプレーの場合の例である。スポット型スプレーでは、基板18の略幅方向(搬送方向に交叉する方向)に複数のスプレー93aを配し、供給用パイプ110aから送られた処理液を基板面方向に噴射し、該噴射液が基板18の幅方向の全面をカバーするようになっている。また、ライン型スプレーでは、スリット状(ライン型)の噴射口が基板18の略幅方向の面をカバーするように配し、供給用パイプ110bから送られた処理液を基板面方向に噴射するようになっている。超音波スプレー95についても、超音波スプレー93の場合とほぼ同じである。本第3の実施例においても、装置構成の簡易化と寸法の小形化を図り易い。処理液の使用量も少なくできる。さらに、処理液の再利用も可能である。飛散した処理液や異物等の基板への再付着も防止で

きるし、処理流体により基板を外部雰囲気から遮断することにより処理むらをなくした高精度処理も可能である。特に本実施例では、処理液や異物等を確実に基板から除去できかつ再付着も大幅軽減または防止できるため、それらの除去率を改善できる。なお、図4の実施例構成では、基本構成のユニットを2基用いる構成としたが、本発明はこれには限定されず、3基以上のユニットを用いる構成であってもよい。また、該ユニット内の構成も、図1や、図4、図5に示した構成には限定されず、例えば、配列する親水性部材の数を増やした構成等

であってもよい。また、超音波スプレーを工程上の複数箇所に設け、複数回の超音波洗浄を行うようにしてもよい。超音波スプレーの構成も上記とは別の構成のものであってもよい。上記ユニットの構成や組合せ、処理液の種類や供給方法、吸引の条件、回転ブラシの構成や回転速度、超音波スプレーの構成や液噴射の条件、基板搬送速度等は、処理対象の基板の種類や状態等に対応させて変えるようにすると、基板面の損傷防止や、処理効率の改善等を図ることができる。

【0014】以下、(1)図2に示す第1の実施例によりレジストの残渣(残渣)処理を行った場合の薬液使用量の実測結果例と、(2)図3に示す第2の実施例によりブラシ洗浄を行った場合の異物除去の実測結果例につき説明する。(1)の場合、被処理基板としては、非晶質Siを成膜後、ホト、現像、エッチング、アッシングを行ってパターンニングした基板を用い、第1の上部処理液としてモノエタノールアミンを用い、第2の上部処理液及び第2の下部処理液としては純水を用い、該第1の上部処理液は被処理基板と親水性部材の間に十分に充填した状態で供給は停止した。比較のために行った従来の通常のスピニング方式処理においても、処理液は、被処理基板の全面が該処理液で覆われた状態で供給を停止した。かかる条件下で、本発明方式の装置と従来方式の装置のそれぞれにつき、基板に対して薬液処理とリンス処理とを行った結果、消費された処理液の量(レジスト残渣処理に必要な残渣処理液使用量)は、本発明方式の場合が0.5L、従来方式の場合が5.0Lで、本発明での薬液消費量は従来方式に比べ大幅に減少し1/10となった。また、(2)の場合、被処理基板としては、全面に非晶質Si膜を成膜した基板を用い、洗浄される異物としてはガラスの粉碎粒子を用い、予め被処理基板上に500個程度を付着させておいた。洗浄後再付着した異物と、除去されずに残った残留異物との区別は、異物検査装置の異物座標において、処理前と処理後の座標状態を比較することで区別した。また、本発明との比較には従来の通常の平流方式のブラシ洗浄処理装置を用いた。実験の結果、ブラシ洗浄による再付着異物数は、本発明方式の場合が12個、従来方式の場合が89個で、本発明の場合、異物の再付着数が著しく減少した。従って、上記実測結果からも、本発明の顕著な効果が確認さ

れた。

【0015】なお、上記実施例では、親水性表面と撥水性表面とをそれぞれ別個の部材で構成したが、本発明はこれに限定されず、両表面を1つの部材上に形成するようにしてもよい。また、上記実施例では、処理液または上記板状基板に対して外力を与える手段として、回転ブラシ、または超音波スプレーの構成例としたが、本発明はこれに限定されず、他の手段であってもよい。また、これら手段を適宜組合わせて併用するようにしてもよい。また、上記実施例では、基板の両面を処理する構成としているが、本発明は、基板の片面を処理する構成であってもよい。さらにまた、上記各実施例では各ユニットを直線状に配列し隙間部を直線状に形成するようにしているが、本発明はこれに限定されず、処理対象の形状、材質、設置環境等により、直線状以外の隙間部となるようにしてもよい。さらに、処理対象としては、基板以外の例えばパネルなどであってもよいし、また、形状も、板状以外のものであってもよい。さらにまた、貫通状の隙間部に処理液を保持する手段として、撥水性部材を用いる構成としたが、他の技術を用いる構成であってもかまわない。

【0016】

【発明の効果】本発明によれば、装置の小形化、処理液の節減、処理液や異物の除去率の改善、処理むらの防止等が可能となる。

【図面の簡単な説明】

【図1】本発明における処理液充填部の基本構造を示す図である。

【図2】本発明の第1の実施例を示す図である。

【図3】本発明の第2の実施例を示す図である。

【図4】本発明の第3の実施例を示す図である。

【図5】超音波スプレーノズルの配列構成例を示す図である。

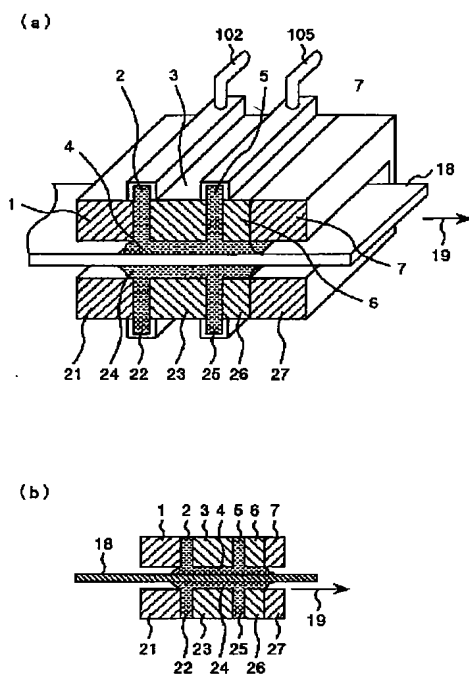
【符号の説明】

1…第1の上部撥水性部材、 2…第1の上部処理液の上部吸引口、 3…第1の上部親水性部材、 4…第1の上部処理液、 5…第1の上部処理液の上部供給口、 6…第2の上部親水性部材、 7…第2の上部撥水性部材、 8…第1の上部不活性気体供給口、 15…第4の上部撥水性部材、 16…第2の上部不活性気体供給口、 18…板状基板、 21…第1の下部撥水性部材、 22…第1の下部処理液の下部吸引口、 23…第1の下部親水性部材、 24…第1の下部処理液、 25…第1の下部処理液の下部供給口、 26…第2の下部親水性部材、 27…第2の下部撥水性部材、 35…第4の下部撥水性部材、 36…第2の下部不活性気体供給口、 47…第2の上部処理液吸引口、 48…第1の上部飛沫飛散防止板、 49…上部回転ブラシ、 51…第2の上部飛沫飛散防止板、 52…第3の上部処理液吸引口、 79…下部回転ブラシ、 93…上

部超音波スプレー、 95…下部超音波スプレー、 9 *ー。
3a…スポット型スプレー、 93b…ライン型スプレ*

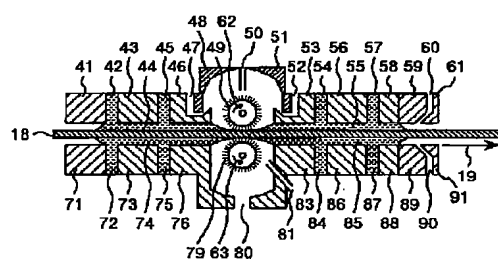
【図 1】

1



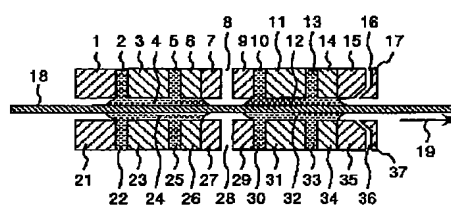
【圖 3】

图 3



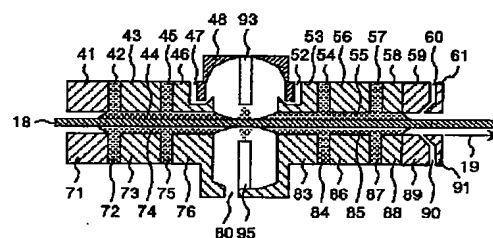
【図2】

2



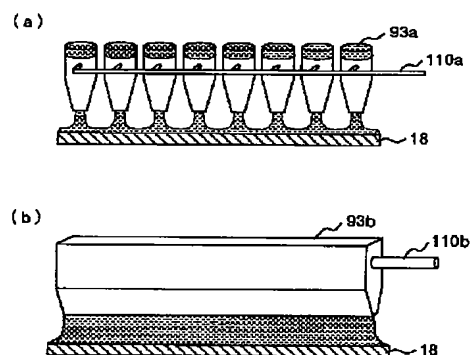
【図4】

4



【图5】

5



フロントページの続き

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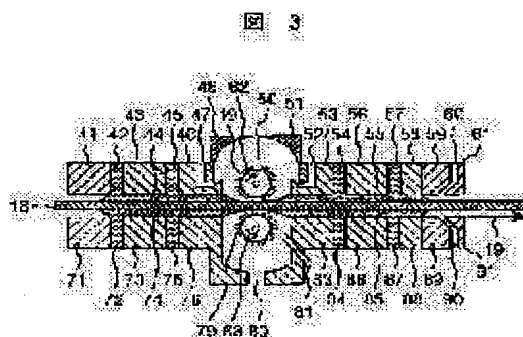
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(54) PROCESSOR FOR PLATE-SHAPED SUBSTRATE AND PROCESSING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To contrive the simplification and downsizing of device constitution, the reduction in quantity of used treatment liquid, and the sharp relaxation of readhesion of foreign matter, in the processing of a plate-shaped substrate.

SOLUTION: This processor is equipped with first and second processing parts the space between whose hydrophilic surfaces in opposition is charged with treatment liquid, and a third processing part which lies between those first and second processing parts and gives external force to the treatment liquid or a substrate to be processed, and each of the first and second processing part has a first member having the above hydrophilic surface, and a second member which lies on the side of the end of that first member and whose opposed hydrophobic surface forms a space part roughly continuous to the space part of that first member and which repels the treatment liquid in the vicinity of that end to the side of that first member.



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CLAIMS

[Claim(s)]

[Claim 1] The 1st processing section with which processing liquid was filled up into the clearance section between the hydrophilic front faces which counter in the processor of the tabular substrate which processes a tabular substrate by the fluid, this --- with the 2nd processing section which is allotted after the 1st processing section and gives external force to processing liquid or the above-mentioned tabular substrate this --- the 3rd processing section with which processing liquid was filled up into the clearance section between the hydrophilic front faces which are allotted after the 2nd processing section and counter --- having --- this --- the 1st and 3rd processing section with the 1st member which has the above-mentioned hydrophilic front face, respectively Have the 2nd member crawled to the 1st member side, and it is constituted. the clearance section in which the water-repellent front face which exists and counters the edge side of this 1st member carries out abbreviation continuation at the clearance section of this 1st member --- forming --- processing liquid --- an edge near [this] --- setting --- this --- The processor of the tabular substrate characterized by the configuration which was made to carry out fluid processing of the above-mentioned tabular substrate with the above-mentioned processing liquid by letting each above-mentioned clearance section of each above-mentioned clearance section of the processing section of the above 1st, the processing section of the above 2nd, and the processing section of the above 3rd pass.

[Claim 2] The 1st processing section with which processing liquid was filled up into the clearance section between the hydrophilic front faces which counter in the processor of the tabular substrate which processes a tabular substrate by the fluid, this --- it being allotted after the 1st processing section, and external force being given to processing liquid or the above-mentioned tabular substrate, and at least a foreign matter from the front face of this substrate with the 2nd processing section which carries out forcible removal this --- with the scattering liquid intake section which sucks in the processing liquid which dispersed by processing actuation of the 2nd processing section the 3rd processing section with which processing liquid was filled up into the clearance section between the hydrophilic front faces which are allotted after the processing section of the above 2nd and counter --- having --- and --- this --- the 1st and 3rd processing section with the 1st member which has the above-mentioned hydrophilic front face, respectively Have the 2nd member crawled to a 1st member side, and it is constituted. the clearance section in which the water-repellent front face which exists and counters the edge side of this 1st member carries out abbreviation continuation at the clearance section between the above-mentioned hydrophilic front faces of this 1st member --- forming --- processing liquid --- an edge near [this] --- setting --- this --- The processor of the tabular substrate characterized by reducing the reattachment to this substrate although this removed while removing the foreign matter at least by letting the above-mentioned clearance section of the above-mentioned clearance section of the processing section of the above 1st, the processing section of the above 2nd, and the processing section of the above 3rd pass for the above-mentioned tabular substrate.

[Claim 3] The 1st processing section with which processing liquid was filled up into the clearance section between the hydrophilic front faces which counter in the processor of the tabular substrate which processes a tabular substrate by the fluid, The 2nd processing section equipped with the rotation brush which a brush rotates so that external force may be given to processing liquid or the above-mentioned tabular substrate, The scattering liquid intake means which sucks in the processing liquid which dispersed in rotation of this rotation brush, The 3rd processing section with which processing liquid was filled up into the clearance section between the hydrophilic front faces which are allotted after the processing section of the above 2nd and counter, A processing liquid supply means to supply the above-mentioned processing liquid to either of the above 1st, 2nd, and 3rd processing section at least, the processing liquid intake means which sucks in the supplied this processing liquid, and the 4th processing section which injects inert gas on the front face of the above-mentioned substrate --- having --- and --- this --- the 1st and 3rd processing section with the 1st member which has the above-mentioned hydrophilic front face, respectively Have the 2nd member crawled to a 1st member side, and it is constituted. the clearance section in which the water-repellent front face which exists and counters the edge side of this 1st member carries out abbreviation continuation at the clearance section between the above-mentioned hydrophilic front faces of this 1st member --- forming --- processing liquid --- an edge near [this] --- setting --- this --- While removing a foreign matter at least by letting the above-mentioned clearance section of the above-mentioned clearance section of the processing section of the above 1st, the processing section of the above 2nd, and the processing section of the above 3rd, and the processing section of the above 4th pass for the above-mentioned tabular substrate The processor of the tabular substrate characterized by the this thing for which the reattachment to this substrate was reduced although removed.

[Claim 4] The 1st processing section with which processing liquid was filled up into the clearance section between the hydrophilic front faces which counter in the processor of the tabular substrate which processes a tabular substrate by the fluid, The 2nd processing section by which processing liquid is injected from an ultrasonic spray to the above-mentioned processing liquid or the above-mentioned tabular substrate, The 3rd processing section with which processing liquid was filled up into the clearance section between the hydrophilic front faces which are allotted after the scattering liquid intake means which sucks in the processing liquid which dispersed in this injection, and the processing section of the above 2nd, and counter, A processing liquid supply means to supply the above-mentioned processing liquid to either of the above 1st, 2nd, and 3rd processing section at least, the processing liquid intake means which sucks in the supplied this processing liquid, and the 4th processing section which injects inert gas on the front face of the above-mentioned substrate -- having -- and -- this -- the 1st and 3rd processing section with the 1st member which has the above-mentioned hydrophilic front face, respectively Have the 2nd member crawled to a 1st member side, and it is constituted. the clearance section in which the water-repellent front face which exists and counters the edge side of this 1st member carries out abbreviation continuation at the clearance section between the above-mentioned hydrophilic front faces of this 1st member -- forming -- processing liquid -- an edge near [this] -- setting -- this -- While removing a foreign matter at least by letting the above-mentioned clearance section of the above-mentioned clearance section of the processing section of the above 1st, the processing section of the above 2nd, and the processing section of the above 3rd, and the processing section of the above 4th pass for the above-mentioned tabular substrate The processor of the tabular substrate characterized by the this thing for which the reattachment to this substrate was reduced although removed.

[Claim 5] in the processor of the tabular substrate which processes a tabular substrate by the fluid, a hydrophilic front face separates the 1st clearance, and it counters mutually, and allots -- having -- this -- with the 1st processing section with which processing liquid was filled up into the 1st clearance section this -- with the gas-charging section with which a water-repellent front face separates a clearance, and it counters mutually, and is allotted [it is allotted after the 1st processing section, and], and inert gas is filled up into this clearance section a hydrophilic front face separates the 2nd clearance, and it counters mutually, and allots -- having -- this -- with the 2nd processing section with which processing liquid was filled up into the 2nd clearance section In the condition of equipping the front face of the above-mentioned tabular substrate with the 3rd processing section which injects inert gas, and having made it the processing liquid of the processing section of the above 1st and the processing liquid of the processing section of the above 2nd not mixed by the above-mentioned gas-charging section The processor of the tabular substrate characterized by the configuration which was made to carry out fluid processing of the above-mentioned tabular substrate by letting the processing section of the above 1st, the above-mentioned gas-charging section, the processing section of the above 2nd, and the 3rd processing section pass.

[Claim 6] The processor of a tabular substrate given in either of claims 1-5 by which distance between the above-mentioned hydrophilic front faces is considered as 6mm or less of abbreviation.

[Claim 7] The above-mentioned processing liquid supply means and the above-mentioned processing liquid intake means are the processor of the tabular substrate according to claim 3 or 4 formed in the processing section of the above 1st, and the processing section of the above 3rd, respectively.

[Claim 8] The above-mentioned processing liquid supply means and the above-mentioned processing liquid intake means are the processor of the tabular substrate according to claim 7 arranged so that this processing liquid supply means may be the backside and this processing liquid intake means may be on a before side to the migration direction of the above-mentioned tabular substrate.

[Claim 9] The processor of a tabular substrate given in either of claims 1-5 from which the processing liquid with which the processing section of the above 1st is filled up, and the processing liquid with which the processing section of the above 2nd is filled up differ.

[Claim 10] The step which performs 1st processing to a tabular substrate in the part with which the hydrophilic front face separated the clearance, it was mutually allotted in the state of opposite in the art of the tabular substrate which processes a tabular substrate by the fluid, and processing liquid was filled up into this clearance section, this -- with the step which gives external force to the processing liquid or the tabular substrate with which it this filled up after the 1st processing, and removes a foreign matter from the front face of this processed substrate at least The step which performs 2nd processing in the step which sucks in the processing liquid which dispersed in this removal actuation, and the part with which the hydrophilic front face separated the clearance, and it countered mutually, and was allotted after this removal actuation, and processing liquid was filled up into this clearance section, The art of the tabular substrate characterized by reducing the reattachment to this substrate although this removed while removing a foreign matter from this tabular substrate at least through the step which injects inert gas on the front face of the above-mentioned tabular substrate.

[Claim 11] The 1st processing section with which processing liquid was filled up into the clearance section between the member front faces which counter in the processor of the tabular substrate which processes a tabular substrate by the fluid, this -- with the 2nd processing section which is allotted after the 1st processing section and gives external force to processing liquid or the above-mentioned tabular substrate the 3rd processing section with which processing liquid was filled up into the clearance section between the member front faces which are allotted after the processing section of the above 2nd and counter -- having -- this -- the 1st and 3rd processing section with the 1st member with which the above-mentioned processing liquid is filled up into the clearance section between front faces, respectively Have the front face made larger than the case where it calls at the 1st member front face, have the 2nd member which forms in the above-mentioned clearance section between the front faces of

this 1st member the 2nd clearance section which carries out abbreviation continuation, and it is constituted. the edge side of this 1st member -- it is -- the surface tension of this processing liquid -- this -- The processor of the tabular substrate characterized by the configuration which was made to carry out fluid processing of the above-mentioned tabular substrate by letting each above-mentioned clearance section of each above-mentioned clearance section of the processing section of the above 1st, the processing section of the above 2nd, and the processing section of the above 3rd pass.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] The invention in this application relates to the fluid processing technique of tabular substrates, such as a liquid crystal substrate and a semi-conductor substrate, and relates to the technique of intercepting a substrate from an external ambient atmosphere with a fluid, and processing it especially.

[0002]

[Description of the Prior Art] Generally as fluid down stream processing at the time of manufacture of the conventional liquid crystal substrate etc. The wet etching process which uses a resist, a nitride, etc. as a mask and carries out etching removal of the thin film with a drug solution in order to form a pattern, Residue down stream processing which removes the resist residue after carrying out ashing of the resist, In order to remove down stream processing by the alkaline oxidizer addition water solution for oxidation and etching to remove a foreign matter, and a foreign matter, the washing process washed with fluids, brushes, etc., such as pure water and a weak alkaline water solution, is made typical. In the above-mentioned fluid down stream processing, after processing with a supersonic wave or a brush, carrying out the spray of a drug solution or the pure water, rotating a processed substrate in atmospheric air, the approach of drying, while carrying out the spray of the inert gas and rotating it at high speed, and the approach of the so-called plain stream method of performing processing of washing or desiccation in atmospheric air while conveying a processed substrate with thin-film-izing, enlargement, etc. of a processed substrate again are used.

[0003]

[Problem(s) to be Solved by the Invention] However, it has set on the above-mentioned conventional technique, and there is a fault to which the gap also originated in this since substrate processing was performed in atmospheric air. For example, in the case of the above-mentioned rotary system, the contamination which adhered in the processing chamber can wind up by turbulence of the air current generated at the time of desiccation processing, and it has the problem of carrying out the reattachment to a substrate side, and has the problem that the contamination in which it dispersed with the brush or the ultrasonic spray also in the above-mentioned plain stream method adheres to the front face of the once washed substrate again. Moreover, problems, such as enlargement of a processing chamber, increase of the installation area of equipment, and the amount-used increase of the drug solution for processing, are also produced with enlargement of a substrate. The technical-problem point of this invention can carry out prevention or the large mitigation of the reattachment to substrates, such as a foreign matter which carried out that (1) equipment configuration is easy and can be miniaturized, that the amount of (2) processing liquid used can also be lessened, that the high precision processing without (3) processing unevenness is possible, and (4) scattering. The purpose of this invention is to offer the processing technique of the tabular substrate which solved this technical-problem point.

[0004]

[Means for Solving the Problem] The 1st processing section by which processing liquid was filled up with this invention into the clearance section between the hydrophilic front faces which counter in the processor of the tabular substrate which processes (1) tabular substrate by the fluid in order to solve the technical-problem point describing above, this -- with the 2nd processing section which is allotted after the 1st processing section and gives external force to processing liquid or the above-mentioned tabular substrate this -- the 3rd processing section with which processing liquid was filled up into the clearance section between the hydrophilic front faces which are allotted after the 2nd processing section and counter -- having -- this -- the 1st and 3rd processing section with the 1st member which has the above-mentioned hydrophilic front face, respectively It considers as a configuration with the 2nd member crawled to a 1st member side. the clearance section in which the water-repellent front face which exists and counters the edge side of this 1st member carries out abbreviation continuation at the clearance section between the above-mentioned hydrophilic front faces of this 1st member -- forming -- processing liquid -- an edge near [this] -- setting -- this -- The above-mentioned tabular substrate is considered as the configuration which carries out fluid processing by letting each above-mentioned clearance section of each above-mentioned clearance section of the processing section of the above 1st, the processing section of the above 2nd, and the processing section of the above 3rd pass.

(2) The 1st processing section with which processing liquid was filled up into the clearance section between the hydrophilic front faces which counter in the processor of the tabular substrate which processes a tabular substrate by the fluid, this -- it being allotted after the 1st processing section, and external force being given to processing

liquid or the above-mentioned tabular substrate, and at least a foreign matter from the front face of this substrate with the 2nd processing section which carries out forcible removal this -- with the scattering liquid intake section which sucks in the processing liquid which dispersed by processing actuation of the 2nd processing section the 3rd processing section with which processing liquid was filled up into the clearance section between the hydrophilic front faces which are allotted after the processing section of the above 2nd and counter -- having -- and -- this -- the 1st and 3rd processing section with the 1st member which has the above-mentioned hydrophilic front face, respectively It considers as a configuration with the 2nd member crawled to a 1st member side. the clearance section in which the water-repellent front face which exists and counters the edge side of this 1st member carries out abbreviation continuation at the clearance section between the above-mentioned hydrophilic front faces of this 1st member -- forming -- processing liquid -- an edge near [this] -- setting -- this -- While removing a foreign matter at least by letting the above-mentioned clearance section of the above-mentioned clearance section of the processing section of the above 1st, the processing section of the above 2nd, and the processing section of the above 3rd pass for the above-mentioned tabular substrate, although this removed, the reattachment to this substrate is reduced.

[0005] (3) The 1st processing section with which processing liquid was filled up into the clearance section between the hydrophilic front faces which counter in the processor of the tabular substrate which processes a tabular substrate by the fluid, The 2nd processing section equipped with the rotation brush which a brush rotates so that external force may be given to processing liquid or the above-mentioned tabular substrate, The scattering liquid intake means which sucks in the processing liquid which dispersed in rotation of this rotation brush, The 3rd processing section with which processing liquid was filled up into the clearance section between the hydrophilic front faces which are allotted after the processing section of the above 2nd and counter, A processing liquid supply means to supply the above-mentioned processing liquid to either of the above 1st, 2nd, and 3rd processing section at least, the processing liquid intake means which sucks in the supplied this processing liquid, and the 4th processing section which injects inert gas on the front face of the above-mentioned substrate -- having -- and -- this -- the 1st and 3rd processing section with the 1st member which has the above-mentioned hydrophilic front face, respectively It considers as a configuration with the 2nd member crawled to a 1st member side. the clearance section in which the water-repellent front face which exists and counters the edge side of this 1st member carries out abbreviation continuation at the clearance section between the above-mentioned hydrophilic front faces of this 1st member -- forming -- processing liquid -- an edge near [this] -- setting -- this -- While removing a foreign matter at least by letting the above-mentioned clearance section of the above-mentioned clearance section of the processing section of the above 1st, the processing section of the above 2nd, and the processing section of the above 3rd, and the processing section of the above 4th pass for the above-mentioned tabular substrate, although this removed, the reattachment to this substrate is reduced.

(4) The 1st processing section with which processing liquid was filled up into the clearance section between the hydrophilic front faces which counter in the processor of the tabular substrate which processes a tabular substrate by the fluid, The 2nd processing section by which processing liquid is injected from an ultrasonic spray to the above-mentioned processing liquid or the above-mentioned tabular substrate, The 3rd processing section with which processing liquid was filled up into the clearance section between the hydrophilic front faces which are allotted after the scattering liquid intake means which sucks in the processing liquid which dispersed in this injection, and the processing section of the above 2nd, and counter, A processing liquid supply means to supply the above-mentioned processing liquid to either of the above 1st, 2nd, and 3rd processing section at least, the processing liquid intake means which sucks in the supplied this processing liquid, and the 4th processing section which injects inert gas on the front face of the above-mentioned substrate -- having -- and -- this -- the 1st and 3rd processing section with the 1st member which has the above-mentioned hydrophilic front face, respectively It considers as a configuration with the 2nd member crawled to a 1st member side. the clearance section in which the water-repellent front face which exists and counters the edge side of this 1st member carries out abbreviation continuation at the clearance section between the above-mentioned hydrophilic front faces of this 1st member -- forming -- processing liquid -- an edge near [this] -- setting -- this -- While removing a foreign matter at least by letting the above-mentioned clearance section of the above-mentioned clearance section of the processing section of the above 1st, the processing section of the above 2nd, and the processing section of the above 3rd, and the processing section of the above 4th pass for the above-mentioned tabular substrate, although this removed, the reattachment to this substrate is reduced.

[0006] (5) a hydrophilic front face separates the 1st clearance, it counters mutually, and the processor of the tabular substrate which processes a tabular substrate by the fluid is arranged -- having -- this -- with the 1st processing section with which processing liquid was filled up into the 1st clearance section this -- with the gas-charging section with which a water-repellent front face separates a clearance, and it counters mutually, and is allotted [it is allotted after the 1st processing section, and], and inert gas is filled up into this clearance section a hydrophilic front face separates the 2nd clearance, and it counters mutually, and allots -- having -- this -- with the 2nd processing section with which processing liquid was filled up into the 2nd clearance section In the condition of equipping the front face of the above-mentioned tabular substrate with the 3rd processing section which injects inert gas, and having made it the processing liquid of the processing section of the above 1st and the processing liquid of the processing section of the above 2nd not mixed by the above-mentioned gas-charging section The above-mentioned tabular substrate is considered as the configuration which was made to carry out fluid processing by letting the processing section of the above 1st, the above-mentioned gas-charging section, the processing

section of the above 2nd, and the 3rd processing section pass.

(6) Consider distance between the above-mentioned hydrophilic front faces as 6mm or less of abbreviation in (5) from the above (1).

(7) Prepare each of the above-mentioned processing liquid supply means and the above-mentioned processing liquid intake means in the processing section of the above 1st, and the processing section of the above 3rd in the above (3) or (4).

(8) In the above (7), to the migration direction of the above-mentioned tabular substrate, allot the above-mentioned processing liquid supply means and the above-mentioned processing liquid intake means so that this processing liquid supply means may be the backside and this processing liquid intake means may be on a before side.

(9) Make it the processing liquid with which the processing section of the above 1st is filled up in (5) from the above (1) differ from the processing liquid with which the processing section of the above 2nd is filled up.

[0007] (10) The step which performs 1st processing to a tabular substrate in the part with which the hydrophilic front face separated the clearance, it was mutually allotted in the state of opposite as an art of the tabular substrate which processes a tabular substrate by the fluid, and processing liquid was filled up into this clearance section, this — with the step which gives external force to the processing liquid or the tabular substrate with which it this filled up after the 1st processing, and removes a foreign matter from the front face of this processed substrate at least The step which performs 2nd processing in the step which sucks in the processing liquid which dispersed in this tailing actuation, and the part with which the hydrophilic front face separated the clearance, and it countered mutually, and was allotted after this tailing actuation, and processing liquid was filled up into this clearance section, While removing a foreign matter from this tabular substrate at least through the step which injects inert gas on the front face of the above-mentioned tabular substrate, although this removed, the reattachment to this substrate is reduced.

(11) The 1st processing section with which processing liquid was filled up into the clearance section between the member front faces which counter in the processor of the tabular substrate which processes a tabular substrate by the fluid, this — with the 2nd processing section which is allotted after the 1st processing section and gives external force to processing liquid or the above-mentioned tabular substrate the 3rd processing section with which processing liquid was filled up into the clearance section between the member front faces which are allotted after the processing section of the above 2nd and counter — having — this — the above-mentioned processing liquid the 1st and 3rd processing section with the 1st member filled up by the clearance section between front faces, respectively Have the front face made larger than the case where it calls at the 1st member front face, and it considers as a configuration with the 2nd member which forms the 2nd clearance section which carries out abbreviation continuation at the above-mentioned clearance section between the front faces of this 1st member. the edge side of this 1st member — it is — the surface tension of this processing liquid — this — It is made to carry out fluid processing of the above-mentioned tabular substrate by letting each above-mentioned clearance section of each above-mentioned clearance section of the processing section of the above 1st, the processing section of the above 2nd, and the processing section of the above 3rd pass.

[0008]

[Embodiment of the Invention] Hereafter, the example of this invention is explained using a drawing. The example of 1 configuration is shown, drawing 1 is the explanatory view of the basic configuration of the processing section in this invention, and (b) is [(a) is a perspective view and] the sectional view. In drawing 1 1 processing liquid suction opening and 3 for the 1st water-repellent member and 2 The 1st hydrophilic member, In 4, processing liquid and 5 the 2nd hydrophilic member and 7 for a processing liquid feed hopper and 6 The 2nd water-repellent member, The conveyance direction of this tabular substrate 18 and 21 the tabular substrate which 18 processes, and 19 The 1st lower water repellence member, 22 — suction opening of the 1st lower processing liquid, and 23 — for the feed hopper of the 1st lower processing liquid, and 26, as for the 2nd lower water repellence member and 102, the 2nd lower hydrophilic-property member and 27 are [the 1st lower hydrophilic-property member and 24 / the 1st lower processing liquid and 25 / the pipe for processing liquid suction and 105] the pipes for processing liquid supply. It meets in the conveyance direction 19 of the processed substrate 18. The 1st water-repellent member 1 and the 1st lower water repellence member 21, The processing liquid suction opening 2, the suction opening 22 of the 1st lower processing liquid, and the 1st hydrophilic member 3, The 1st lower hydrophilic-property member 23, the processing liquid feed hopper 5, and the feed hopper 25 of the 1st lower processing liquid, The 2nd hydrophilic member 6, the 2nd lower hydrophilic-property member 26, and the 2nd water-repellent member 7, The 1st water-repellent member 1 and the 1st lower water repellence member 21 are made to counter. the 2nd lower water repellence member 27 — allotting — this — Make the 1st hydrophilic member 3 and the 1st lower hydrophilic-property member 23 counter, the 2nd hydrophilic member 6 and the 2nd lower hydrophilic-property member 26 are made to counter, and the 2nd water-repellent member 7 and the 2nd lower water repellence member 27 are made to have countered. this — in the clearance section formed in the opposite section of the 1st hydrophilic member 3 and the 1st lower hydrophilic-property member 23, and the opposite section of the 2nd hydrophilic member 6 and the 2nd lower hydrophilic-property member 26 Processing liquid 4 and 24 is supplied to the clearance section from the above-mentioned processing liquid feed hopper 5 and the feed hopper 25 of the 1st lower processing liquid, and superfluous processing liquid is discharged at an exterior side from the processing liquid suction opening 2 and the suction opening 22 of the 1st lower processing liquid. It may let the processing liquid suction pipe 102 pass only for the liquid from the processing liquid suction opening 2, and you may make it the processing liquid from the suction opening 22 of the 1st lower processing liquid also let this processing liquid suction pipe 102 pass together in the

discharge by the side of the exterior of processing liquid. the processing liquid supplied from the above-mentioned processing liquid feed hopper 5 and the feed hopper 25 of the lower processing liquid of the above 1st — the same — the processing liquid delivery pipe 105 to this processing liquid feed hopper 5 — this — processing liquid may be supplied to the feed hopper 25 of the 1st lower processing liquid, or you may make it supply each feed hoppers 5 and 25 from a respectively separate delivery pipe As for supply and suction of this processing liquid, it is desirable to be carried out so that abbreviation equalization may be carried out crosswise [of the tabular substrate 18] and the flow of liquid may occur. In the opposite section of the 1st water-repellent member 1 and the 1st lower water repellence member 21, and the opposite section of the 2nd water-repellent member 7 and the 2nd lower water repellence member 27 Processing liquid 4 and 24 is crawled in the direction of opposite section gap Mabe of the 1st hydrophilic member 3 and the 1st lower hydrophilic-property member 23, and the opposite section clearance section of the 2nd hydrophilic member 6 and the 2nd lower hydrophilic-property member 26, and the surface tension in this section of this processing liquid is heightened. In this condition, the inside of the above-mentioned processing liquid is processed [through, washing, etc.] for a substrate 18. During conveyance migration of the tabular substrate 18, processing liquid 4 and 24 It supplies continuously from the processing liquid feed hopper 5 and the feed hopper 25 of the 1st lower processing liquid, and as it discharges outside continuously, may make it form flow in the clearance section from the processing liquid suction opening 2 and the suction opening 22 of the 1st lower processing liquid, and Or you may change into the condition of carrying out neither supply nor discharge at the time of processing. With the configuration of this example, when forming the flow of processing liquid, it is made for this flow direction to become in the direction contrary to the conveyance direction of this substrate 18, it carries out making it the relative velocity of the flow of the liquid to a substrate 18 increase etc., and has been easy to remove the foreign matter etc. from a substrate side. Moreover, 6mm or less of abbreviation of the dimension (distance between opposed faces) of the clearance section formed in the opposite section of the 1st hydrophilic member 3 and the 1st lower hydrophilic-property member 23 and the opposite section of the 2nd hydrophilic member 6 and the 2nd lower hydrophilic-property member 26 is good. A substrate 18 touches time amount processing liquid with a fixed front rear face during conveyance migration, and is processed by coincidence with processing liquid. When the processed substrate 18 is a hydrophilic property, the 2nd water-repellent member 7 is adjoined, an inert gas feed hopper is allotted outside, and processing liquid, remnants, etc. which are attached to the substrate side can be removed by injecting this inert gas to a substrate 18 there. The example of a configuration (the 1st example) which combined the inert gas supply configuration with a basic unit like above-mentioned drawing 1 as an example of this invention hereafter, the example of a configuration (the 2nd example) which combined the rotation brush, and the example of a configuration (the 3rd example) which combined the ultrasonic spray unit are shown. In each example, wet etching processing, residue processing, drug solution washing processing, tailing washing processing, etc. are possible. [0009] Drawing 2 shows the 1st example of this invention. The example of **** 1 is an example of a configuration for drug solution processing, and is the configuration of having allotted two inert gas feed zones between [this] units using the unit of a basic configuration which was stated to above-mentioned drawing 1. In the 1st unit, drug solution processing is performed to the tabular substrate 18, and rinse processing is performed to this substrate 18 through an inert gas field by the 2nd unit. this inert gas field — this inert gas — this — while making into a cut off state the processing liquid (a drug solution, rinse) of each other with which the interior of the 1st and 2nd unit was filled up and making it not mixed mutually, it adhered to the substrate 18 conveyed from this 1st unit — processing liquid (drug solution) removal is carried out. In drawing 2 in the upper part of the tabular substrate 18 as a processed substrate The 1st up water repellence member 1, the up suction opening 2 of the 1st up processing liquid, the 1st up hydrophilic-property member 3, the feed hopper 5 of the 1st up processing liquid, the 2nd up hydrophilic-property member 6, the 2nd up water repellence member 7, the feed hopper 8 of the 1st up inert gas, the 3rd up water repellence member 9, The up suction opening 10 of the 2nd up processing liquid, the 3rd up hydrophilic-property member 11, the up feed hopper 13 of the 2nd up processing liquid, the 4th up hydrophilic-property member 14, the 4th up water repellence member 15, the 2nd up inert gas feed hopper 16, and the 5th up water repellence member 17 are allotted. In the lower part of this tabular substrate 18 The 1st lower water repellence member 21, the lower suction opening 22 of the 1st lower processing liquid, the 1st lower hydrophilic-property member 23, the feed hopper 25 of the 1st lower processing liquid, the 2nd lower hydrophilic-property member 26, the 2nd lower water repellence member 27, the feed hopper 28 of the 1st lower inert gas, the 3rd lower water repellence member 29, The lower suction opening 30 of the 2nd lower processing liquid, the 3rd lower hydrophilic-property member 31, the lower feed hopper 33 of the 2nd lower processing liquid, the 4th lower hydrophilic-property member 34, the 4th lower water repellence member 35, the 2nd lower inert gas feed hopper 36, and the 5th lower water repellence member 37 are allotted. The 1st up water repellence member 1, the up suction opening 2 of the 1st up processing liquid, the 1st up hydrophilic-property member 3, the feed hopper 5 of the 1st up processing liquid, the 2nd up hydrophilic-property member 6, and the 2nd up water repellence member 7, The 1st lower water repellence member 21 by which opposite arrangement was carried out, the lower suction opening 22 of the 1st lower processing liquid, the 1st lower hydrophilic-property member 23, the feed hopper 25 of the 1st lower processing liquid, the 2nd lower hydrophilic-property member 26, and the 2nd lower water repellence member 27 constitute the 1st unit of the above in each. The 3rd up water repellence member 9, the up suction opening 10 of the 2nd up processing liquid, the 3rd up hydrophilic-property member 11, the up feed hopper 13 of the 2nd up processing liquid, the 4th up hydrophilic-property member 14, and the 4th up water repellence member 15, The 3rd lower water repellence member 29 by which opposite arrangement was carried out, the lower suction opening 30 of the 2nd lower processing liquid, the 3rd lower hydrophilic-property member 31, the lower feed hopper 33 of the 2nd lower

processing liquid, the 4th lower hydrophilic-property member 34, and the 4th lower water repellence member 35 constitute the 2nd unit of the above in each. In this example, the 1st up processing liquid 4 and the 1st lower processing liquid 24 are drug solutions used for for example, etching processing or washing processing, and the 2nd up processing liquid 12 and the 2nd lower processing liquid 32 are pure water used for example, for rinses. Etching, washing, etc. of the rear face of a substrate 18 of the 1st lower processing liquid 24 or the 2nd lower processing liquid 32 are effective to rear-face processing of a substrate. When a substrate 18 passes through the field of the 1st processing liquid (drug solution) 4 and 24, etching processing, washing processing, etc. are performed, and rinse processing etc. is performed when passing through the field of the 2nd processing liquid (pure water) 12 and 32. The inert gas supplied from the 1st up inert gas feed hopper 8 and the 1st lower inert gas feed hopper 28 removes the 1st processing liquid and processing remnants from a substrate 18 while carrying out it as [mix / both processing liquid / intercept between the 1st processing liquid (drug solution) 4 and 24 and the 2nd processing liquid 12 and 32 (pure water), and / mutually]. Unmixed processing liquid can be reused easily, respectively and may raise the rinse effectiveness of a substrate 18 in the 2nd processing liquid 12 and 32 (pure water) especially. Moreover, the inert gas supplied from the 2nd up inert gas feed hopper 16 and the 2nd lower inert gas feed hopper 36 removes the 2nd processing liquid and processing remnants from a substrate 18. as mentioned above -- processing the tabular substrate 18 is the process conveyed and according to the 1st processing liquid (drug solution) at the 1st unit of the above, and the inert-gas field of the above-mentioned beginning -- this -- the inert-gas field of removal of the 1st processing liquid, processing according to the 2nd processing liquid (pure water) at the 2nd unit of the above, and the above 2nd -- this -- removal of the 2nd processing liquid is performed, respectively and a series of processings are finished. According to this example, a configuration is easy and tends to attain the miniaturization of equipment. The amount of the processing liquid used can also be lessened. Furthermore, reuse of processing liquid is also possible. The high precision processing which abolished processing unevenness is also possible by also being able to mitigate or prevent the reattachment to the substrate of the contamination which dispersed, and intercepting a substrate from an external ambient atmosphere with a processing fluid. In addition, although two sets were considered as the configuration using the unit of a basic configuration, this invention is not limited to this but you may make it constitute it from an above-mentioned example using three or more sets of units. You may be the configuration which increased the number of the hydrophilic members which the configuration in this unit is not limited to the configuration shown in drawing 1 or drawing 2, either, for example, arrange it.

[0010] Drawing 3 shows the 2nd example of this invention. The example of **** 2 is an example of a configuration at the time of using a rotation brush, and is the configuration of having allotted the processing section with the rotation brushes 49 and 79 between [this] units like the case of the 1st example of the above, using the unit of a basic configuration which was stated to drawing 1 two sets. In this example, pure water etc. performs washing processing to the tabular substrate 18 in the 1st unit, and the 2nd unit also performs rinse processing by pure water etc. to this substrate 18 through processing with a rotation brush. In this example, the brush of a roll mold is used as a rotation brush. In down stream processing with this rotation brush, while a brush gives external force to processing liquid (pure water) or the above-mentioned tabular substrate by rotation actuation and removes processing liquid, a foreign matter, etc. from the field of a substrate 18 compulsorily, the foreign matter which was once removed from the substrate side and entered into processing liquid is made not to carry out the reattachment to a substrate side. The configuration which sucked in the processing liquid which dispersed in rotation of this rotation brush is also prepared, and it has also been made not to carry out the reattachment of this scattering processing liquid to a substrate 18. In drawing 3 in the upper part of the tabular substrate 18 The 1st up water repellence member 41, the up suction opening 42 of the 1st up processing liquid, the 1st up hydrophilic-property member 43, the feed hopper 45 of the 1st up processing liquid, the 2nd up hydrophilic-property member 46, the 2nd up processing liquid suction opening 47, the 1st up droplet scattering prevention plate 48, the up rotation brush 49, The 2nd up processing liquid feed hopper 50, the 2nd up droplet scattering prevention plate 51, the 3rd up processing liquid feed hopper 52, the 3rd up hydrophilic-property member 53, the 4th up processing liquid suction opening 54, the 4th up hydrophilic-property member 56, the 3rd up processing liquid feed hopper 57, the 5th up hydrophilic-property member 58, The 2nd up water repellence member 59, the up inert gas feed hopper 60, and the 3rd up water repellence member 61 are allotted. In the lower part of this tabular substrate 18 The 1st lower water repellence member 71, the up suction opening 72 of the 1st lower processing liquid, the 1st lower hydrophilic-property member 73, the feed hopper 75 of the 1st lower processing liquid, the 2nd lower hydrophilic-property member 76, the lower rotation brush 49, the 2nd lower processing liquid suction opening 80, the 2nd lower processing liquid feed hopper 81, The 3rd lower hydrophilic-property member 83, the 4th lower processing liquid suction opening 84, the 4th lower hydrophilic-property member 86, the 3rd lower processing liquid feed hopper 87, the 5th lower hydrophilic-property member 88, the 2nd lower water repellence member 89, the lower inert gas feed hopper 90, and the 3rd lower water repellence member 91 are allotted. The 1st up water repellence member 41, the up suction opening 42 of the 1st up processing liquid, the 1st up hydrophilic-property member 43, the feed hopper 45 of the 1st up processing liquid, and the 2nd up hydrophilic-property member 46, The 1st lower water repellence member 71 by which opposite arrangement was carried out, the up suction opening 72 of the 1st lower processing liquid, the 1st lower hydrophilic-property member 73, the feed hopper 75 of the 1st lower processing liquid, and the 2nd lower hydrophilic-property member 76 constitute the 1st unit of the above in each. The 3rd up hydrophilic-property member 53, the 4th up processing liquid suction opening 54, the 4th up hydrophilic-property member 56, the 3rd up processing liquid feed hopper 57, the 5th up hydrophilic-property member 58, and the 2nd up water repellence member 59, The 3rd lower hydrophilic-property member 83 by which opposite arrangement was carried

out, the 4th lower processing liquid suction opening 84, the 4th lower hydrophilic-property member 86, the 3rd lower processing liquid feed hopper 87, the 5th lower hydrophilic-property member 88, and the 2nd lower water repellence member 89 constitute the 2nd unit of the above in each. From the substrate 18 washed in the 1st unit, the rotation brushes 49 and 79 perform removal of a foreign matter etc., and removal of processing liquid, the rinse of this substrate 18 is carried out in the 2nd unit, and the inert gas supplied from the up inert gas feed hopper 60 and the lower inert gas feed hopper 90 removes processing liquid, a foreign matter, etc. from a substrate 18 further. Scattering is interrupted with the 1st up droplet scattering prevention plate 48 and the 2nd up droplet scattering prevention plate 51, and the droplet of the processing liquid generated in rotation of the up rotation brush 49 is absorbed by the 2nd up processing liquid suction opening 47 and the 3rd up processing liquid suction opening 52, and is discharged at an exterior side. This droplet dispersing to the perimeter of equipment, or carrying out the reattachment to a substrate 18 by this, is mitigated or prevented.

[0011] Also in the example of **** 2, it is easy to attain simplification of an equipment configuration, and the miniaturization of a dimension. The amount of the processing liquid used can also be lessened. Furthermore, reuse of processing liquid is also possible. The high precision processing which abolished processing unevenness is also possible by also being able to prevent the reattachment to substrates which dispersed, such as processing liquid and a foreign matter, and intercepting a substrate from an external ambient atmosphere with a processing fluid. Since processing liquid, a foreign matter, etc. are certainly removable especially from a substrate by this example, and it can large-mitigate or the reattachment can also be prevented, these elimination factors are greatly improvable. In addition, although two sets were considered as the configuration using the unit of a basic configuration in the example of drawing 3, this invention may not be limited to this but may be a configuration using three or more sets of units. You may be the configuration which increased the number of the hydrophilic members which the configuration in this unit is not limited to the configuration shown in drawing 1 or drawing 3, either, but arrange it. Moreover, a rotation brush is also formed in two or more places, and you may make it equipped with two or more rotation brush down stream processing.

[0012] Drawing 4 shows the 3rd example of this invention. The example of **** 3 is a configuration at the time of using an ultrasonic spray unit, and is the configuration of having allotted two ultrasonic spray units between [this] units using the unit of a basic configuration which was stated to drawing 1. It differs to the 2nd example of the above in that change to the rotation brushes 49 and 79 and the ultrasonic sprays 93 and 95 are used. Also in the example of **** 3, to the tabular substrate 18, washing processing by pure water etc. is performed in the 1st unit, and the 2nd unit performs rinse processing by pure water etc. through the washing processing by the pure water in the ultrasonic sprays 93 and 95 etc. Processing liquid, such as pure water injected from the ultrasonic sprays 93 and 95, gives external force according to the injection force to the front face and rear face of the processing liquid 44, 55, 74, and 85 which has this injection tip caudad, or the above-mentioned tabular substrate 18. this external force — this processing liquid 44, 55, 74, and 85 of this section — a stirring condition — or it changes into the condition near it and the front face of this substrate 18 is washed, and also when the injection liquid from the ultrasonic sprays 93 and 95 hits this substrate 18 front face directly, this injection liquid washes this substrate side. Scattering is interrupted with the 1st up droplet scattering prevention plate 48 and the 2nd up droplet scattering prevention plate 51, and the droplet of the processing liquid generated in the injection from the up supersonic-wave spray 93 is absorbed by the 2nd up processing liquid suction opening 47 and the 3rd up processing liquid suction opening 52, and is discharged at an exterior side. Thereby, this droplet can mitigate or prevent dispersing to the perimeter of equipment or carrying out the reattachment to a substrate 18.

[0013] Drawing 5 is the example of a concrete configuration of the above-mentioned ultrasonic spray 93, and, in the case of an other unit type spray, (b) of (a) is an example in the case of the Rhine mold spray. By the other unit type spray, two or more spray 93a is allotted crosswise [of a substrate 18 / abbreviation] (direction which crosses in the conveyance direction), the processing liquid sent from pipe 110 for supply a is injected in the direction of a substrate side, and this injection liquid covers the whole surface of the cross direction of a substrate 18. Moreover, by the Rhine mold spray, it allots so that a slit-like (Rhine mold) injection tip may cover the field of the abbreviation cross direction of a substrate 18, and the processing liquid sent from pipe 110 for supply b is injected in the direction of a substrate side. Also about the ultrasonic spray 95, it is almost the same as the case of the ultrasonic spray 93. Also in the example of **** 3, it is easy to attain simplification of an equipment configuration, and the miniaturization of a dimension. The amount of the processing liquid used can also be lessened. Furthermore, reuse of processing liquid is also possible. The high precision processing which abolished processing unevenness is also possible by also being able to prevent the reattachment to substrates which dispersed, such as processing liquid and a foreign matter, and intercepting a substrate from an external ambient atmosphere with a processing fluid. Since processing liquid, a foreign matter, etc. are certainly removable especially from a substrate by this example, and it can large-mitigate or the reattachment can also be prevented, those elimination factors are improvable. In addition, although two sets were considered as the configuration using the unit of a basic configuration with the example configuration of drawing 4, this invention may not be limited to this but may be a configuration using three or more sets of units. Moreover, the configurations in this unit may also be drawing 1, a configuration which increased the number of the hydrophilic members which it is not limited to the configuration shown in drawing 4 and drawing 5, for example, are arranged. Moreover, an ultrasonic spray is formed in two or more [on a process], and it may be made to perform ultrasonic cleaning of multiple times. You may be the thing of configuration also with the configuration of an ultrasonic spray another [the above]. If the configuration of the configuration of the above-mentioned unit, the class of combination and processing liquid, the supply approach and the conditions of suction,

and a rotation brush, the configuration of rotational speed and an ultrasonic spray, the conditions of liquid injection, a substrate bearer rate, etc. are made to correspond to a class, a condition, etc. of a substrate of a processing object and are changed, they can aim at damage prevention of a substrate side, an improvement of processing effectiveness, etc.

[0014] It explains per example of an observation result of tailing when the example of an observation result of the amount of the drug solution used when the 1st example shown in (1) drawing 2 performs residue (remnants) processing of a resist hereafter, and the 2nd example shown in (2) drawing 3 perform brush washing. In the case of (1), as a processed substrate Phot, development after forming amorphous Si, Monoethanolamine is used as 1st up processing liquid using the substrate which performed and carried out pattern NINGU of etching and the ashing, as the 2nd up processing liquid and the 2nd lower processing liquid -- pure water -- using -- this -- supply stopped in the condition of fully having been filled up with the 1st up processing liquid between the processed substrate and the hydrophilic member. Also in the comparative conventional usual spin method processing which went to accumulate, processing liquid suspended supply, where the whole surface of a processed substrate is covered with this processing liquid. Under these conditions, it is attached to each of the equipment of this invention method, and the equipment of the conventional method. As a result of performing drug solution processing and rinse processing to a substrate, as for the amount (the amount of the residue processing liquid used required for resist residue processing) of the consumed processing liquid, the case where the cases of this invention method are 0.5L and the conventional method is 5.0L, and decreased sharply compared with the conventional method, and the drug solution consumption in this invention became 1/10. Moreover, about 500 pieces were made to adhere on a processed substrate beforehand in the case of (2), using the grinding particle of glass as a foreign matter washed by the whole surface as a processed substrate using the substrate which formed the amorphous Si film. The distinction with the foreign matter which carried out the after [washing] reattachment, and the residual foreign matter which remained without being removed was distinguished by comparing the coordinate condition processing before and after processing in the foreign matter coordinate of foreign matter test equipment. Moreover, the brush washing processor of the conventional usual plain stream method was used for the comparison with this invention. As a result of the experiment, the case where the cases of this invention method are 12 pieces and the conventional method is 89 pieces, and, as for the number of reattachment foreign matters by brush washing, in the case of this invention, the number of reattachment of a foreign matter decreased remarkably. Therefore, the remarkable effectiveness of this invention was checked also from the above-mentioned observation result.

[0015] In addition, although the hydrophilic front face and the water-repellent front face were constituted from a respectively separate member, this invention is not limited to this but you may make it form both front faces on one member in the above-mentioned example. Moreover, although considered as the example of a configuration of a rotation brush or an ultrasonic spray in the above-mentioned example as a means to give external force to processing liquid or the above-mentioned tabular substrate, this invention may not be limited to this but may be other means. Moreover, you may make it use together, combining these means suitably. Moreover, although considered as the configuration which processes both sides of a substrate in the above-mentioned example, this invention may be the configuration of processing one side of a substrate. Although each unit is arranged in the shape of a straight line and he is trying to form the clearance section in the shape of a straight line in each above-mentioned example further again, this invention is not limited to this but you may make it serve as the clearance sections other than the shape of a straight line according to the configuration of a processing object, the quality of the material, an installation environment, etc. Furthermore, as a processing object, you may be panels other than a substrate etc., and configurations may also be things other than tabular. Although considered as the configuration using a water-repellent member as a means to hold processing liquid in the clearance section of the letter of penetration further again, you may be a configuration using other techniques.

[0016]

[Effect of the Invention] According to this invention, the miniaturization of equipment, reduction of processing liquid, an improvement of the elimination factor of processing liquid or a foreign matter, prevention of processing unevenness, etc. are attained.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the basic structure of the processing liquid restoration section in this invention.

[Drawing 2] It is drawing showing the 1st example of this invention.

[Drawing 3] It is drawing showing the 2nd example of this invention.

[Drawing 4] It is drawing showing the 3rd example of this invention.

[Drawing 5] It is drawing showing the example of an array configuration of an ultrasonic spray nozzle.

[Description of Notations]

1 — 1st up water repellence member 2 — Up suction opening of the 1st up processing liquid, 3 — 1st up hydrophilic-property member 4 — 1st up processing liquid 5 — The up feed hopper of the 1st up processing liquid, 6 — 2nd up hydrophilic-property member 7 — 2nd up water repellence member 8 — The 1st up inert gas feed hopper, 15 — 4th up water repellence member 16 — The 2nd up inert gas feed hopper, 18 — Tabular substrate 21 — 1st lower water repellence member 22 — Lower suction opening of the 1st lower processing liquid, 23 — 1st lower hydrophilic-property member 24 — 1st lower processing liquid 25 — The lower feed hopper of the 1st lower processing liquid, 26 — 2nd lower hydrophilic-property member 27 — The 2nd lower water repellence member, 35 — 4th lower water repellence member 36 — The 2nd lower inert gas feed hopper, 47 — The 2nd up processing liquid suction opening, 48 — The 1st up droplet scattering prevention plate, 49 — Up rotation brush 51 — The 2nd up droplet scattering prevention plate, 52 — 3rd up processing liquid suction opening 79 — Lower rotation brush 93 — Up supersonic-wave spray 95 — Lower supersonic-wave spray 93a — Other unit type spray 93b — The Rhine mold spray.

[Translation done.]